

Appl. No. 10/029,323

Reply to Office Action of February 8, 2005

This listing of claims will replace all prior versions, and listings, of claims in the application.

LISTING OF CLAIMS

1. (Amended) A front-end circuit for at least one of a multi-mode and multi-band
5 ~~a~~ communication terminal device ~~with a multi-band and/or multi-mode~~
~~transmission system~~, comprising:
- at least one switch element selected from the group consisting of RF
switches, duplexers and diplexers;
- a common antenna;
- 10 a first transmission system being mixed mode filters for a mixed mode
transmission system with configured to operate in a mixed
FDD/TDD mode; ~~and~~
- a second transmission system being pure mode filters for a pure mode
transmission system with configured to operate in a pure FDD or
15 pure TDD mode;
- mixed mode filters provided for said first transmission system;
- pure mode filters provided for said second transmission system; and
- a connecting circuit via which ~~wherein~~ individual filters of said mixed mode
filters and said pure mode filters are connected to said common
20 antenna ~~via a circuit with~~, said connecting circuit comprising said at
least one switch element.
2. (Original) The circuit according to claim 1, further comprising:
- a diplexer;
- 25 wherein a transmission band and a reception band of a transmission
system form a band pair, a frequency difference between band
pairs of a first and of a second transmission system amounts to

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approximately one octave, said diplexer being arranged between said common antenna and said filters for distinguishing between said band pairs.

5 3. (Original) The circuit according to claim 1, further comprising:

an RF switch;

wherein a transmission band and a reception band of a transmission system respectively form a band pair, frequencies of two band pairs of a first and of a second transmission system lying within
10 approximately an octave, said RF switch being arranged between said common antenna and said filters for distinguishing between said band pairs.

4. (Original) The circuit according to claim 3, wherein said RF switch is a multiple
15 switch, which additionally enables switching for a TDD mode.

5. (Original) The circuit according to claim 1, further comprising a low pass filter as a transmission filter.

20 6. (Original) The circuit according to claim 1, further comprising a diplexer for separating a transmission band and a reception band for said FDD mode in said pure FDD mode transmission system or in said mixed mode transmission system, said diplexer having a band pass filter or a steep-edge low pass filter as a filter for a transmission path.

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7. (Amended) The circuit according to claim 27 4, further comprising

a common filter for two reception bands for said mixed mode transmission system, said common filter being part of a diplexer for separating a

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- transmission band and a reception band of said pure FDD mode system; and
- a further filter for a transmission band of said pure FDD mode transmission system; and
- 5 an RF switch between said common antenna, said further filter and said duplexer.
8. (Amended) The circuit according to claim 27 4, further comprising:
- an RF switch between a common transmission path for said pure FDD mode transmission system and said pure TDD mode transmission system and two transmission filters; and
- 10 an RF multiple switch at said antenna for switching between a duplexer for said FDD mode, a transmission filter and a reception filter for said TDD mode;
- 15 frequency bands of said mixed mode transmission system being clearly spaced from one another.
9. (Original) The circuit according to claim 1, further comprising filters and signal paths for a further transmission system with pure FDD or pure TDD mode in
- 20 addition to said transmission system with mixed FDD/TDD mode and said transmission system with pure FDD or TDD mode.
10. (Original) The circuit according to claim 9, further comprising:
- an RF switch at an antenna side of said circuit for a TDD system; and
- 25 a duplexer for each FDD system.
11. (Original) The circuit according to claim 10, further comprising:

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a diplexer, and

components for a further mixed transmission system in addition to said mixed and said two pure systems, at least one mixed transmission system being separated from other transmission systems at said antenna side by said diplexer.

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12. (Original) The circuit according to claim 1, wherein said switches are fashioned as GaAs FET transistors.

10 13. (Original) The circuit according to claim 1, wherein said switches are realized with PIN diodes having additional phase shifters.

14. (Amended) The circuit according to claim 1, wherein said at least one switch is formed as a component comprising at least one of a switches are fashioned as

15 a device selected from the group consisting of GaAs FET transistor and a transistors and PIN diode diodes having additional phase shifters, wherein at least one of said pure-mode filters or said mixed-mode filters is realized as an independent component, comprising at least one filter selected from the group consisting of a said RF filters and duplexers being fashioned independently of
20 one another as entities selected from the group consisting of SAW filter filters, an MWK filter filters, an FBAR filter filters, a strip-line filter filters, and an chip LC filter filters or as combinations of said filters.

15. (Original) The circuit according to claim 1, wherein individual components of the circuit are arranged in a discrete manner on a common printed circuit board.

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16. (Original) The circuit according to claim 1 wherein at least a part of discrete components of said circuit is integrated in a common substrate.

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17. (Original) The circuit according to claim 16, wherein all individual components together with a DC drive are integrated in a common substrate that is realized in a multi-layer technique with partially planar structures.

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18. (Amended) The circuit according to claim 1, further comprising a directional coupler for regulating power of a power amplifier as part of a detector of at least one transmission input.

10 19. (Amended) The circuit according to claim 1, further comprising a protective element that protects a transmission amplifier against feedback or reflected power and is selected from a group consisting of an insulator and a circulator, and is arranged between a transmission amplifier and a transmission filter.

15 20. (Original) A mobile radiotelephone device of the third generation, comprising:

a front-end circuit for a communication terminal device with a multi-band and/or multi-mode transmission system, comprising:

20 at least one switch element selected from the group consisting of RF switches, duplexers and diplexers;

a common antenna;

mixed mode filters for a mixed mode transmission system with a mixed FDD/TDD mode; and

25 pure mode filters for a pure mode transmission system with a pure FDD or pure TDD mode;

wherein individual filters of said mixed mode filters and said pure mode filters are connected to said common antenna via a circuit with said

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at least one switch element, and said mobile radiotelephone device
being operated in a system of the third generation.

21. (Original) A mobile radiotelephone device, comprising:

- 5 a front-end circuit for a communication terminal device with a multi-band
and/or multi-mode transmission system, comprising:
at least one switch element selected from the group consisting of
RF switches, duplexers and diplexers;
a common antenna;
10 mixed mode filters for a mixed mode transmission system with a
mixed FDD/TDD mode; and
pure mode filters for a pure mode transmission system with a pure
FDD or pure TDD mode;
wherein individual filters of said mixed mode filters and said pure
15 mode filters are connected to said common antenna via a
circuit with said at least one switch element, and said mobile
radiotelephone device being operated in a system of the
second and the third generation.

20 22. (Original) A front-end circuit for a communication terminal device with a
multi-band and/or multi-mode transmission system, comprising:

- at least one switch element selected from the group consisting of RF
switches, duplexers and diplexers;
a common antenna;
25 FDD pure mode filters for a pure mode transmission system with a pure
FDD mode; and
TDD pure mode filters for a pure mode transmission system with a pure
TDD mode;

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wherein individual filters of said FDD pure mode filters and said TDD pure mode filters are connected to said common antenna via a circuit with said at least one switch element.

- 5 23. (Original) The circuit according to claim 22, further comprising an RF switch between a common transmission path for said pure FDD mode transmission system and said pure TDD mode transmission system and two transmission filters.
- 10 24. (New) A front-end circuit for a multi-mode communication terminal device, comprising:
- at least one switch element selected from the group consisting of RF switches, duplexers and diplexers;
 - a common antenna;
 - 15 a first transmission system being a mixed mode transmission system configured to operate in a mixed FDD/TDD mode;
 - a second transmission system being a pure mode transmission system configured to operate in a pure FDD mode or a pure TDD mode;
 - mixed mode filters provided for said first transmission system;
 - 20 pure mode filters provided for said second transmission system;
 - a connecting circuit via which individual filters of said mixed mode filters and said pure mode filters are connected to said common antenna, said connecting circuit comprising said at least one switch element;
 - wherein frequency bands of mixed mode and pure mode systems are
 - 25 overlapping or adjacent to each other.

25. (New) A front-end circuit for at least one of a multi-band and multi-mode communication terminal device, comprising:

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- at least one RF switch;
- a common antenna;
- a first transmission system being a mixed mode transmission system
configured to operate in a mixed FDD/TDD mode;
- 5 a second transmission system being a pure mode transmission system
configured to operate in a pure FDD mode or a pure TDD mode;
- mixed mode filters provided for said first transmission system;
- pure mode filters provided for said second transmission system;
- a connecting circuit via which individual filters of said mixed mode filters
10 and said pure mode filters are connected to said common antenna,
said connecting circuit comprising said at least one switch element;
- wherein a transmission band and a reception band of at least one of said
pure mode transmission and said mixed mode transmission system
form a band pair;
- 15 wherein said RF switch is a multiple switch, said RF switch being arranged
between said common antenna and said filters for separating said
band pairs of different transmission system, wherein said multiple
switch additionally enables switching for a TDD mode.
- 20 26. (New) A front-end circuit for a multi-band and multi-mode communication
terminal device, comprising:
- at least one switch element that is a diplexer comprising a low pass and a
high pass;
- a common antenna;
- 25 a first transmission system being a mixed mode transmission system
configured to operate in a mixed FDD/TDD mode;
- a second transmission system being a pure mode transmission system
configured to operate in a pure FDD mode or a pure TDD mode;

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5 mixed mode filters provided for said first transmission system;
pure mode filters provided for said second transmission system; and
a connecting circuit via which individual filters of said mixed mode filters
and said pure mode filters are connected to said common antenna,
said connecting circuit comprising said at least one switch element

27. (New) A front-end circuit for a multi-mode communication terminal device,
comprising:

10 at least one switch element selected from the group consisting of RF
switches, duplexers and diplexers;
a common antenna;
a first transmission system being a pure mode transmission system
configured to operate in a pure TDD mode;
15 a second transmission system being a pure mode transmission system
configured to operate in a pure FDD mode;
filters provided for said first and second transmission systems;
a connecting circuit via which individual filters of said filters are connected
to said common antenna, said connecting circuit comprising said at
least one switch element.

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28. (New) The circuit of claim 27, wherein frequency bands of said first and
second transmission systems are overlapping or adjacent to each other.

25 29. (New) The circuit according to claim 1, wherein said switch is a duplexer,
wherein said duplexer is realized as an independent component and comprises
at least one filter selected from the group consisting of a SAW filter, an MWK
filter, an FBAR filter, a strip-line filter, and an LC-filter.